

Report from the Airplane Performance Harmonization Working Group

Issue: Obstacle Accountability Area

Rule Section: FAR 121.189/JAR-OPS 1.495

1 - What is underlying safety issue to be addressed by the FAR/JAR? [Explain the underlying safety rationale for the requirement. Why should the requirement exist? What prompted this rulemaking activity (e.g., new technology, service history, etc.)?]

It is fundamental to operational safety that the pilot should be able to safely complete a takeoff and clear all obstacles beyond the runway end, even if power is lost from the most critical engine just before the airplane reaches a defined go/no-go point. This principle has formed the basis of the takeoff performance standards required for the type certification and operation of turbine engine powered transport category airplanes since Special Civil Air Regulation No. SR-422, effective August 27, 1957. As of March 20, 1997, the application of this principle was extended by the “commuter rule” to also cover scheduled passenger-carrying operations conducted in airplanes that have a passenger seat configuration of 10 to 30 passengers and turbojet airplanes regardless of seating configuration.

2 - What are the current FAR and JAR standards relative to this subject? [Reproduce the FAR and JAR rules text as indicated below.]

Current FAR text:

Part 121

FAR 121.189 Airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine-engine-powered airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual-

- (2) In the case of an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

(e) In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff,

Part 135

FAR 135.379 Large transport category airplanes: Turbine engine powered: Takeoff limitations.

(d) No person operating a turbine-engine-powered large transport category airplane may take off that airplane at a weight greater than that listed in the Airplane Flight Manual-

- (2) For an airplane certificated after September 30, 1958 (SR422A, 422B), that allows a net takeoff flight path that clears all obstacles either by a height of at least 35 feet vertically, or by at least 200 feet horizontally within the airport boundaries and by at least 300 feet horizontally after passing the boundaries.

(e) In determining maximum weights, minimum distances, and flight paths under paragraphs (a) through (d) of this section, correction must be made for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff,

Current JAR text:

JAR-OPS 1.495 Take-off Obstacle Clearance

(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 ft or by a horizontal distance of at least 90 m plus $0.125 \times D$, where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus $0.125 \times D$ may be used.:

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(d) When showing compliance with sub-paragraph (a) above for those cases where the intended flight path does not require track changes of more than 15° , an operator need not consider those obstacles which have a lateral distance greater than:

- (1) 300 m if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area. (see AMC OPS 1.495(d)(1)&(e)(1); or);
- (2) 600 m for flights under all other conditions.

(e) When showing compliance with sub-paragraph (a) above for those cases where the intended flight path does require track changes of more than 15° , an operator need not consider those obstacles which have a lateral distance greater than:

- (3) 600 m if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area. (see AMC OPS 1.495(d)(1)&(e)(1); or);
- (4) 900 m for flights under all other conditions.

2a – If no FAR or JAR standard exists, what means have been used to ensure this safety issue is addressed? [Reproduce text from issue papers, special conditions, policy, certification action items, etc., that have been used relative to this issue]

N/A

3 - What are the differences in the FAA and JAA standards or policy and what do these differences result in? [Explain the differences in the standards or policy, and what these differences result in relative to (as applicable) design features/capability, safety margins, cost, stringency, etc.]

The FAA and JAA operating rules have identical vertical obstacle clearance requirements. Both require that the net takeoff flight path, as defined by the airworthiness rules, clear obstacles vertically by the same margin. This results in obstacle clearance that expands vertically with increasing distance from the runway end. The differences arise from the way in which the horizontal obstacle clearance requirements are specified in the respective rules.

Currently, the Part 121/135 operating rules do not define a specific obstacle accountability area, but rather the horizontal margin by which obstacles must be cleared and the conditions under which such clearance must be demonstrated. Any obstacles that come within the horizontal margin must be cleared vertically.

In contrast to the FAA requirements, JAR-OPS 1 defines a horizontal obstacle accountability area which must be used in determining allowable takeoff weights for all Performance Class A airplanes used in commercial air transportation. (Performance Class A airplanes include multi-engine turbopropeller airplanes with a maximum approved passenger seating configuration of more than 9 seats or a maximum takeoff mass exceeding 5700 kilograms, and all multi-engine turbojet powered airplanes.) The obstacle accountability area, which is based on ICAO recommendations, expands laterally with increasing distance from the end of the runway in order to account for the drift of the airplane in a crosswind. Pressure altitude, temperature, speed and bank angle variations, as well as flight technical and navigation guidance tolerances are also assumed to be accounted for. The maximum width of the obstacle accountability area is dependent upon whether track changes greater than 15° are required and upon available navigational accuracy. All obstacles within this area must be cleared vertically.

It could be argued (based on interpretation) that the FAR is more stringent, and provides a higher level of safety than the JAR, because the FAR requires accountability of the wind, including crosswind, and does not specify a maximum width. The JAR defines a horizontal obstacle accountability area that could, in theory, be insufficient to cover the

most adverse crosswind. However, as explained in item 4 below, the JAR is commonly viewed as the more stringent and safer regulation because of ambiguities in the FAR.

4 - What, if any, are the differences in the current means of compliance? [Provide a brief explanation of any differences in the current compliance criteria or methodology (e.g., issue papers), including any differences in either criteria, methodology, or application that result in a difference in stringency between the standards.]

The FAR, while theoretically more stringent, has traditionally been interpreted by some as not requiring crosswind accountability. The phrase “wind component” in FAR 121.189(e) and 135.379(e) is interpreted by some to mean wind along the runway and, as such, does not have a crosswind component. The result of this interpretation has been the use of an obstacle accountability “corridor” which is 200 feet on either side of the extended runway centerline within the airport boundaries and 300 feet on either side of the extended runway centerline outside the airport boundaries. It is interesting to note that the use of the “corridor” is not limited to airplane operators in their obstacle clearance analyses; the FAA itself has used the “corridor” as the basis for regulating obstacle construction around airports.

The difference between the fixed-width “corridor” and the expanding horizontal obstacle accountability area in the JAR can be a source of significant differences in allowable takeoff weight between North American and European operators of the same aircraft on the same runways.

Beginning in 1992, an effort was made to standardize procedures used by U. S. operators to analyze obstacles at certain mountainous airports. This effort evolved into a draft Advisory Circular (120-XXX) that addressed obstacle clearance methods for all airports. The authors of AC 120-XXX made it clear that the effect of crosswind was to be considered in the obstacle clearance analysis and included an expanding horizontal obstacle accountability area. This area expands to a maximum width of 4000 feet, considerably greater than the presently interpreted “600 feet corridor”, but still roughly half the size of the ICAO standard used in the JAR. The obstacle accountability area in the draft AC expands at a rate of $0.0625 \times D$, where D is the distance along the intended flight path from the end of the runway. The minimum half-width within the airport boundaries is 200 feet and outside the airport boundaries is 300 feet. However, the lateral expansion rate becomes $0.125 \times D$ (same as the JAR) whenever track changes of more than 15° are required.. Many U.S. operators currently use the area defined by the draft AC, despite the fact that it was never approved and published and some U.S. operators use the ICAO obstacle accountability area.

5 – What is the proposed action? [Describe the new proposed requirement, or the proposed change to the existing requirement, as applicable. Is the proposed action to introduce a new standard, or to take some other action? Explain what action is being proposed (not the regulatory text, but the underlying rationale) and why that direction was chosen for each proposed action.]

The U.S. operators on the Performance Harmonization Working Group proposed at the outset that AC 120-XXX become the basis for harmonization; however, the working group did not reach a consensus on this issue. The economic impact associated with obstacle clearance can be significant. Takeoff weight can be severely restricted if obstacles must be cleared vertically, which can lead to a loss of revenue if the cargo or passenger payload must be reduced. In some cases, operations would no longer be economically viable. Some members of the working group considered the resulting economic penalty to be too large in relation to the potential safety benefit to recommend harmonization to the JAA requirements.

On the other hand, the JAA would not reduce the size of their obstacle accountability area without a significant amount of data justifying the perceived reduction in safety. Additionally, many JAA member states comply strictly with ICAO standards, meaning that ICAO would have to designate the AC as an acceptable means of compliance with their obstacle clearance requirements. This was seen as a time consuming task. Also, the JAR-OPS 1 rules are harmonized with ICAO provisions for obstacle restriction and removal (Annex 14 specified takeoff climb surface) and the provisions for publication of ICAO Type A obstacle charts/data (Annex 4).

The working group ultimately decided that the obstacle accountability area itself was not the core issue for harmonization as long as both FAA and JAA rules provide the maximum credit for airplane and ground-based course guidance and a well-balanced economic impact on operators. The airplane types being used on competing routes between Europe and North America have advanced course guidance technology and the same ground-based course guidance is available to all operators. The issue of a specific horizontal obstacle accountability area in the current “expanding cone” shape may, or would become, unnecessary when analyzing these airplane types since they are able to accurately fly specific ground tracks in various wind conditions. (However, in their provisions for RNAV departure and approach procedures, both FAA and ICAO continue to use obstacle accountability areas in the form of obstacle identification surfaces.) Operators of airplanes without adequate course guidance capabilities would continue to use the current obstacle accountability area. The working group undertook to revise AC 120-XXX to include specific ground-based navigational tolerances and allow credit for the latest airborne course guidance technologies.

It should be noted, however, that while the Working Group did reach consensus on this approach, the JAA members felt that it would be very difficult to revise JAR-OPS 1.495 to allow greater credit for navigational accuracy. This is because the JAA regulations are closely tied to ICAO standards.

For each proposed change from the existing standard, answer the following questions:

6 - What should the revised standard be? [Insert the proposed text of the harmonized standard here]

Part 121

(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for—

- (5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

Part 135

(e) In determining maximum weights, minimum distances and flight paths under paragraphs (a) through (d) of this section, correction must be made for—

- (5) Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component; and

Summary of Changes

1. Reformat §§ 121.189(e) and 135.379(e) to list, in separate sub-paragraphs, each of the items for which correction must be made. Currently, §§ 121.189(e) and 135.379(e) require correction made to the maximum weights, minimum distances, and flight paths under paragraphs §§ 121.189(a) through (d) and §§ 135.379(a) through (d), respectively, for the runway to be used, the elevation of the airport, the effective runway gradient, the ambient temperature and wind component at the time of takeoff
2. New §§ 121.189(e)(5) and 135.379(e)(5) would list “Wind, including not more than 50 percent of the reported headwind component and not less than 150 percent of the reported tailwind component.” This would replace the criterion, “wind component at the time of takeoff,” currently listed in §§ 121.189(e) and 135.379(e). The proposed wording is intended to clarify that the total wind (i.e., wind speed and direction), not just the headwind or tailwind component, must be considered. For corrections to takeoff distances, only the headwind or tailwind component is relevant. However, for flight path considerations, the total wind must be taken into account.

7 - How does this proposed standard address the underlying safety issue (identified under #1)? [Explain how the proposed standard ensures that the underlying safety issue is taken care of.]

The proposed standard addresses the underlying safety issues by eliminating any confusion with regard to wind accountability. The proposed standard, along with AC 120-XXX, would define obstacle accountability methods that address crosswind effects on the airplane’s flight path.

8 - Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Explain how each element of the proposed change to the standards affects the level of safety relative to the current FAR. It is possible that some portions of the proposal may reduce the level of safety even though the proposal as a whole may increase the level of safety.]

While it does not change the original intent of the existing standard, the proposed standard is intended to remove any ambiguity in the current standard with respect to wind accountability. Therefore, it could be argued that the proposed standard increases the level of safety.

9 - Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain. [Since industry practice may be different than what is required by the FAR (e.g., general industry practice may be more restrictive), explain how each element of the proposed change to the standards affects the level of safety relative to current industry practice. Explain whether current industry practice is in compliance with the proposed standard.]

Relative to current industry practice, the proposed standard increases the level of safety. Those operators interpreting the current standard as not requiring crosswind and using the fixed-width obstacle accountability “corridor” would be required to account for the effect of crosswind on the airplane’s flight path.

10 - What other options have been considered and why were they not selected?

[Explain what other options were considered, and why they were not selected (e.g., cost/benefit, unacceptable decrease in the level of safety, lack of consensus, etc.) Include the pros and cons associated with each alternative.]

The alternatives would be to harmonize on the current FAR standard, retain the current non-harmonized standards, harmonize to a general obstacle clearance requirement like ICAO or harmonize to the JAR standard.

The first option was not chosen because of the JAA’s reluctance to accept a rule that is perceived to be less safe and is not perfectly clear in its intent. The FAA also recognized that current interpretations of the FAR are not acceptable and that some change may be necessary to clarify its intent.

The second option was not seriously considered because the working group recognized the importance of this issue and the members overwhelmingly wanted to work towards consensus.

The third option was not chosen because it did not appear to solve the problem. Some members of the working group suggested that both the FAA and JAA adopt the basic language from ICAO Annex 6 which states that the aircraft must clear all obstacles only by an “adequate margin,” and leave the definition of the margin to advisory material. In this way, the operating rules would be harmonized, even though acceptable compliance methods might be different. Other members saw this as only hiding the issue.

The fourth option was not chosen because of the economic impact associated with introducing the JAR (ICAO) obstacle accountability area at many U.S. airports. During the drafting of AC 120-XXX, it was determined using the FAA digital obstacle database that 48% more obstacles would be introduced if the ICAO obstacle accountability were introduced versus an increase of 15% for the obstacle accountability area prescribed by the AC. The lack of a national standard for obstacle construction, and apparent differences of interpretation of the FARs by various FAA divisions, has allowed obstacles to be constructed up to the edge of the fixed-width “corridor” at many airports. At the time the AC was being drafted, the economic impact to U.S. operators of introducing the ICAO obstacle accountability area was estimated to be \$190 million per year.

11 - Who would be affected by the proposed change? [Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.]

Operators who interpret the current standard as allowing use of the fixed-width obstacle accountability “corridor” would be affected since that interpretation would no longer be permitted unless suitable course guidance could be demonstrated.

12 - To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble? [Does any existing advisory material include substantive requirements that should be contained in the regulation? This may occur because the regulation itself is vague, or if the advisory material is interpreted as providing the only acceptable means of compliance.]

N/A

13 - Is existing FAA advisory material adequate? If not, what advisory material should be adopted? [Indicate whether the existing advisory material (if any) is adequate. If the current advisory material is not adequate, indicate whether the existing material should be revised, or new material provided. Also, either insert the text of the proposed advisory material here, or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, policy, Order, etc.)]

AC 120-XXX should be published to ensure harmonization on the proper interpretation of FAR 121.189 by U.S. operators.

14 - How does the proposed standard compare to the current ICAO standard? [Indicate whether the proposed standard complies with or does not comply with the applicable ICAO standards (if any)]

N/A

15. – Does the proposed standard affect other HWG’s? [Indicate whether the proposed standard should be reviewed by other harmonization working groups and why.]

No.

16 - What is the cost impact of complying with the proposed standard? [Please provide information that will assist in estimating the change in cost (either positive or negative) of the proposed rule. For example, if new tests or designs are required, what is known with respect to the testing or engineering costs? If new equipment is required, what can be reported relative to purchase, installation, and maintenance costs? In contrast, if the proposed rule relieves industry of testing or other costs, please provide any known estimate of costs.]

Those operators currently interpreting FAR 121.189 as requiring obstacle accountability only within the “corridor” would incur costs to comply with the expanding obstacle accountability area defined in AC 120-XXX. These costs have been estimated at approximately \$5.3 million annually for the major ATA members.

No cost impact is expected for those operators already using the AC or ICAO obstacle accountability areas.

17. - If advisory or interpretive material is to be submitted, document the advisory or interpretive guidelines. If disagreement exists, document the disagreement.

AC 120-XXX to be provided.

18. – Does the HWG wish to answer any supplementary questions specific to this project? [If the HWG can think of customized questions or concerns relevant to this project, please present the questions and the HWG answers and comments here.]

No.

19. – Does the HWG want to review the draft NPRM prior to publication in the Federal Register?

Yes.